on certain portions of the shoots, as rather short and stout processes, which give off towards the free extremity a number of tendril-like claspers, by means of which, we may suppose, the slender tufts cling to some neighbouring support. They are also present in the more usual form of simple tubes, and in this condition form a dense and tangled mass of rootlets at the base of the shoots.

We know that some foreign species are also furnished with hooked fibres such as we find on *Scrupocellaria reptans*; and in all such cases we have, no doubt, a similar adaptive modification of the simpler structure.

XXX.—*On a new Genus of Hydroids from the White Sea, with a short Description of other new Hydroids.* By C. Mereschkowsky.

[Plates V. & VI.]

During the summer of 1876 I undertook a journey to the White Sea, the zoology and botany of which are almost completely unknown, with the object of studying its fauna as thoroughly as possible, my attention being principally devoted to the study of invertebrated marine animals. My expectations were fully realized; for this sea, hitherto completely unexplored and almost entirely separated from the Arctic Ocean, afforded me numerous and highly interesting specimens of types differing from those generally observed.

Amongst these I may mention a new and interesting Hydroid, which I now propose to describe.

In the part of the White Sea called the Bay of Onega, at small depths (5 fathoms), and where the bottom is slimy, specimens of *Tellina solidula* are frequently found, with the edge of the shell covered with an agglomeration of small animals of a light yellowish colour, giving off long, thin, floating filaments. On observing this mass more carefully I discovered that it was a colony of hydroids, of the suborder Athecata or Gymnoblastea (Pl. V. fig. 1). They are always to be found on the same Mollusca, and, on all those I have observed, on the same part of the shell. Their hydrorhiza consists apparently of a continuous mass, and not of detached filaments as in most other hydroids (Pl. V. fig. 2, *c*). It appears that the structure of the hydrorhiza is not developed to the same degree as that of the *Hydractinia*, but consists simply of a mass of cœnosarc containing a considerable quantity of thread-cells, and of a thin chitinous membrane, covering this mass and expanding into the hydranth and its short stems (Pl. V. fig. 2, *d*). The hydrorhiza is of a dark greyish colour, and is not covered with spines as in *Hydractinia.* The hydranths proceed from the hydrorhiza; and between them are placed the gonophores (Pl. V. figs. 1, 2).

The principal interest of this hydroid is concentrated in the hydranth, which is of an almost cylindrical shape, rather thinner towards the lower, and abruptly truncated at the upper part. It is attached to the hydrorhiza without the aid of any well-defined hydrocaulus, unless we consider as such the thick chitinous membrane covering the inferior part of the hydranth (Pl. V. fig. 2, *d*), and which, in fact, is but the continuation of the perisarc. The length of a full-grown specimen is 2 millims. The mouth (Pl. V. fig. 2, *a*), a simple regular round aperture, opens at the summit of the body, its diameter being equal to that of the body. I have been unable to detect any trace of a joint, or, in fact, any thing separating the body from the hypostome. The only tentacle (Pl. V. fig. 2, *b*) the hydranth is provided with is attached to the upper third of the body, from which it springs at a small angle: its base is several times the thickness of its extremity; and it grows gradually thinner to about half its length. The extremity is not bulbous. The length of the tentacle increases with age, and in full-grown specimens attains two or three times the length of the whole body. Such prodigiously long tentacles had never been previously remarked in any species of hydroids, and this phenomenon finds an explanation in the following circumstances:—1st, that the hydroid being provided with a single tentacle, the whole nutritive force is concentrated in it, instead of being distributed amongst several, as in other cases; 2nd, that the hydroid being compelled to secure aliments and to defend itself against its natural foes, this organ assumes naturally an abnormal development under the greater activity it is called upon to exercise.

As to the histological structure, Pl. VI. fig. 8 gives a transverse section of the hydranth, showing that it differs in no way from the ordinary structure. We see the mass of the ectoderm, with the nuclei of the cells imperfectly defined; in the ectoderm a considerable number of thread-cells (shown in fig. 5) are dispersed all over the tentacles and the body, particularly on the upper part and round the buccal orifice. This layer of ectoderm is succeeded by a mass of mesoderm forming the muscular substance of the animal; and this is to be remarked on the surface, on account of its being striated; and, lastly, we remark the endoderm formed by small circular cells, disposed in several layers. The lobed aspect remarked in the interior is to be attributed, I think, to immersion in alcohol.

I will now pass to the description of the gonosome or generative bodies. Their number is less than that of the trophosomes (Pl. V. fig. 1) ; but they are of larger size (length from 2 to 3 millims., breadth about 2 millims.). The gonophores are oval, truncated at the upper ends, and grow thinner towards their lower extremity, where they lengthen into a short and slender stem, by means of which they are attached (Pl. V. fig. 2, *e*). There are never any blastostyles on the hydrorhiza.

On observing more attentively the gonophores, I have remarked that they consist of a very thin, transparent, and colourless membrane (Pl. V. figs. 3, *a*, 4, *c*) enveloping a small medusa, which is found there in the different stages of its development.

It is probable that this thin membrane is formed by a continuation of the chitinous envelope of the hydrorhiza. I had not the opportunity of studying a full-grown medusa which had already detached itself from the main body ; but its general features may be inferred from an examination of the newly formed gonophores. I here give two figures showing the structure of the medusa. In Pl. V. fig. 3 we see a rather mature gonophore pressed by a covering-plate, with the slit-sided umbrella and with the velum ; Pl. VI. figs. 12 and 13, show the transverse section of the same gonophore.

I have not paid any particular attention to minuteness and refinement in the delineation of these histological details, my principal aim having been to point out the general distribution of the different parts and organs of the medusa, and not their histological structure.

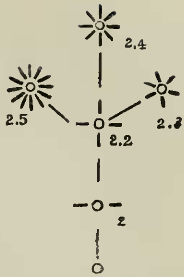
By these figures we see that the medusa is composed of a bell (Pl. V. fig. 3, *b*), the sides of which are crossed by four radiating canals (Pl. V. fig. 3, g^1, g^2, g^3, g^4), indicated by bands of a darker shade, passing into four tentacles (Pl. V. fig. 3, f^1, f^2, f^3, f^4) ; these four radiating canals unite at their base in one circular canal (Pl. V. fig. 3, *h*), from which spring a row of tentacles in the intervals of the four principal tentacles. These latter having been developed at an earlier period, are the largest of the tentacles, of which there are in all sixteen (Pl. V. fig. 6).

From the upper part of each of these radiating canals, at the place where they transform themselves into the digestive cavity of the manubrium (which, I confess, I was not able to detect), proceed two sacs, the canals passing between them

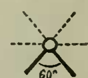
(Pl. V. fig. 3, d^1, d^3, d^5, d^6, d^7, d^8, and figs. 12, 13 of Pl. VI.). I feel no hesitation in ascribing to these eight sacs the functions of the sexual organs in which are contained spermatozoa and ova. My determination of them rests on the following grounds:—1. The medusæ, on account of the simplicity of their organization, cannot have any other organs than the radiating canals, the manubrium, the tentacles, and the sexual organs; and as these sacs can be neither of the three first-named organs, it is evident that they must be considered as the sexual organs. 2. On account of the analogy existing between this hydroid and several species of the Geryonidæ (for instance, *Aglaura Peronii*), in which the sexual sacs, by their form and disposition, bear a great resemblance to the sacs with which we are at present occupied. 3. On account of their contents consisting of two sorts of granules—one set being 0·00047''' in diameter, and the others (evidently produced by the division or the segmentation of the first) being about 0·000235'''. These small granules, obviously spermatozoa in an immature state, are formed, as is well known, by the division of the mother cell into several segments. The existence of such sacs is not often to be observed in the Hydroids, and the originality of the Hydroid now under study is thereby increased. The structure of the medusa is set forth very conspicuously by my two figures (Pl. V. fig. 3, and Pl. VI. figs. 12, 13), drawn from nature by the aid of a camera lucida, and not in the slightest degree diagrammatic.

The young gonophores show a little difference in their construction from those just described. The cross section shows only four sacs (Pl. VI. fig. 14); but if we take these gonophores at a more developed state, the cross section underneath shows eight sacs (Pl. VI. fig. 12)—in the centre four (Pl. VI. fig. 13), but with an interruption at the middle, and in the upper part four without an interruption. From this it follows that at the beginning there appear four sacs, and this number afterwards, by longitudinal division, increases to eight. Moreover the sexual sacs present an interesting peculiarity in their division; that is, the more advanced divisions of two sacs lie opposite each other; and this appearance was noticed by me not once, but on every cross section I made (Pl. VI. fig. 7, *a*, *b*). It appears to be one of the many facts showing that the fundamental number of hydroids is not four, as is usually admitted, but only two, and that all the remaining numbers are nothing else but $2 \times n$, from which it follows that six and ten are not an exception to the rule, but merely 2×3 and 2×5. For such facts, pointing to the number 2 as the basis, refer for instance to the history of the development of some species of Hydroids and Medusæ, from which it is seen that among the Hydroids, for instance, *Clavatella prolifera*, which has in its normal state six tentacles, in its youth has only two; the same with *Perigonimus bitentaculatus*, which perhaps is an embryonic state of another hydroid; to these belong also *Perigonimus quadritentaculatus* (which has two more tentacles developed), *Acharadria larynx*, and the Medusa *Polyxenia leucostyla* (the tentacles of which, as observed by Metchnikoff, make their appearance at first two in number, and afterwards increase by twos). A number of facts in the history of the development of the Medusæ also show that at the commencement there appear only two tentacles, and afterwards gradually two at a time are added, as for instance in:—*Oceania languida*, Ag. (*Campanulina*, V. Ben.); *Lafoëa calcarata*, Ag.; *Melicertum campanula*, Esch.; *Staurophora laciniata*, Ag.; *Stomotoca atra*, Ag.; *Campanulina acuminata*, Ald.; different species of the genus *Perigonimus*, the tentacles of which do not accumulate; also in the *Æginopsis mediterranea*, *Zanclea implexa*, *Saphenia balearica*, *S. bitentaculata*, *S. diadema*, *Oceania diadema*, *Octochila bitentaculata*. Finally, from a number of facts mentioned by Ehrenberg and Brandt, it is seen that the departures from the normal number often present such numbers as are the product of 2 multiplied by 5, 7, 9, 15, &c. (10, 14, 18, 30, 170). Most frequently after the number 4 we meet with the number 6, which is evidently 2×3; whereas the numbers 3, 7, 17, which are not divisible by 2, are seldom met with. The same is seen in *Podocoryne carnea*, which has 4, 6, 8, 10, and 12 tentacles, as is very clearly shown in the drawings of Hincks. *Cladonema radiatum*, which is described by all authors as having ten radiating canals (2×5), in England, according to the researches of Allman, is always found with eight (2×4) canals. *Clavatella prolifera* often has eight instead of six tentacles (in the hydranth). From all these facts, to which I shall allude more particularly another time, it follows that the fundamental number (that is, the number which first appeared, and through the repetition of which were produced all the numbers which we now meet) of the Hydroids as well as of other Medusæ (and all Cœlenterata, in opposition to the Echinodermata, in which five is the number) is 2; and if we accept as real the biogenetical law, it follows that the forefathers of the present Hydroids had only two tentacles, and that, in consequence of the repeating of the number two 2, 3, 4, 5 times and so on, there appeared other morphological types.

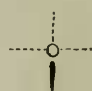
This can be explained by the annexed diagram, showing the genealogy of the types.



As regards the systematic position of this Hydroid, it undoubtedly forms a distinct genus, which I propose to name *Monobrachium*. The species I propose to name *Monobrachium parasitum*, the reason being explained below. If we seek to place it in one of the families known to us, it does not properly belong to any of them, in consequence of its unsymmetrical single tentacle, and is therefore analogous to another interesting hydroid, *Lar sabellarum*, Gosse. I consider it the best course to form for the above-mentioned hydroid a separate family, Monobrachiidæ. Such a new family will find its justification in the great analogy which exists between the two Hydroids, which, therefore, I now proceed to explain. In the first place I take into consideration the analogy of the mode of life of *Lar* and *Monobrachium*. They are both met with always on the same species of animals,—*Lar* on the tube of a worm (*Sabella*), *Monobrachium* on the *Tellina solidula*, and always on the same place, that is, where there are more currents and therefore conveyance of food, upon which the hydroid feeds. *Lar* is always found at the mouth of a sand-tube, from which proceeds the worm, causing a strong eddy with its gills; and the *Monobrachium* on the end of the mollusk (Pl. V. fig. 1). This fact is very important, as it indicates a cause for the appearance of these two Hydroids, and consequently it is the cause of the remaining analogies. And actually, if we compare *Lar* and *Monobrachium* with other Hydroids, it appears that they have the least number of tentacles—*Monobrachium* one, *Lar* only two; therefore it is evident that here the organization is defined. But we cannot regard *Lar* or *Monobrachium* as lower forms from which the higher have been developed, because in the Hydroids, almost without exception, we perceive a symmetrical placing of the parts, so that it is evident such unsymmetrical forms as *Lar* and *Monobrachium* could not be the stock. After the form like *Protohydra Leuckartii*, some form ought to be reckoned having two symmetrically placed tentacles, such as, for instance, *Atractylis bitentaculata* (—o—). Besides this the fully developed medusæ of both Hydroids cannot be regarded as of primitive forms; and every thing shows that as *Lar* and *Monobrachium* are products of degradation, they had at first a greater number of tentacles, and that their mode of life, their parasitism, so to speak, on other animals, by which they profit in seeking their food, was the cause that some of the tentacles, from not being required, were thrown off. Actually the strong eddies formed by the worm as also by the siphons and the foot of the *Tellina*, infallibly bring portions of food, which falling into the mouth of the hydroid do away with that necessity for a great number of tentacles which existed when they led a different kind of life; and thus there appears another analogy between the two hydroids—a more complex form of medusa in comparison with a trophosome reduced to a more retrograde form. And it is clear that the medusa when parted from the trosophome loses those conditions in which the trophosome continues to grow: it is subject to new conditions nearly like those of other medusæ; it swims freely on the surface; and for the struggle of life it requires a good organization. The third analogy is the asymmetry clearly indicated in both the hydroids. The type of the medusæ may serve to show the condition of the trophosome before its degradation. As regards *Lar*, it might be thought that it proceeded from a hydroid which had at first six tentacles; and this supposition reposes on the fact that the medusa has six radial canals and six tentacles, as also on the disposition of its only pair of tentacles, which are not symmetrically placed one opposite the other, but nearly at an angle of 60°, exactly as it would be if from a sexradial type four were taken away (see figure). In this manner the family Laridæ forms a separate branch from the type 2 × 3.



Analogically to this I think it follows that, after all that has been said, *Monobrachium parasitum* forms a separate family, Monobrachiidæ, as a branch detached from the type 2 × 2, as its medusa has only four radiating canals (see figure). The genealogical tree opposite may elucidate the place of *Monobrachium* among the other types.



This Hydroid may be briefly characterized as follows:—

Order HYDROIDA.

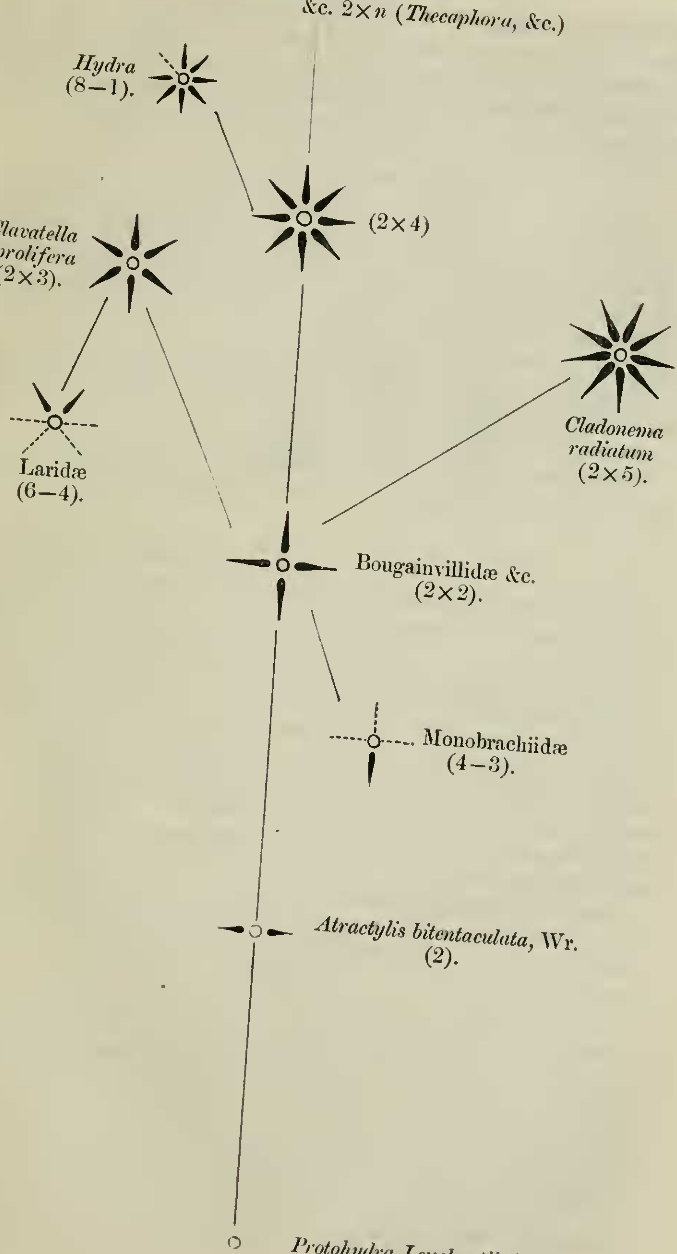
Suborder Athecata.

Fam. **Monobrachiidæ.**

Hydrocaulus not developed; hydranth with a single filiform tentacle; central mouth without lobes. Gonophores medusiform planoblasts with four radiating canals.

Monobrachium, n. g.

Hydrorhiza consisting of a continuous expansion, not composed of a mass of anastomosing stolonic tubes; hydranth


&c. 2×n (*Thecaphora*, &c.)
Hydra (8−1).
(2×4)
Clavatella prolifera (2×3).
Cladonema radiatum (2×5).
Laridæ (6−4).
Bougainvillidæ &c. (2×2).
Monobrachiidæ (4−3).
Atractylis bitentaculata, Wr. (2).
Protohydra Leuckartii, Gr.

cylindrical, truncated above, with a single filiform tentacle, placed higher than the middle of body. Gonophores without blastostyles, medusiform planoblasts; medusa with four radiating canals, sixteen tentacles, and eight well-developed generative sacs, two from each radiating canal.

Monobrachium parasitum, nov. sp.

Trophosome. Hydrocaulus about one fourth or one fifth of the hydranth, formed by a chitinous tube springing from the hydrorhiza, which covers the end of the *Tellina-solidula* shell. Hydranth 2 millims. in length, cylindrical, without a hypostome, truncated at the summit, which is provided with a simple, regular, round aperture.

The single filiform tentacle very long, from three to four times the length of the body, is placed at the upper half of the body at a small angle.

Gonosome. Stem of the gonophore short and thin. The medusa has eight generative sacs of the same length as the bell.

In one of the next numbers of this Journal I will describe a few more equally interesting genera and species of Hydroids from the northern seas of Russia. Thus, for instance, I have two Hydroids from the White Sea which belong to the order Thecaphora (family Sertularidæ), of which I form a separate genus (*Polyserias*); their hydrothecæ are arranged not as usual in two, but in six or even more rows. One of them (Pl. VI. figs. 15, 16) I have named *Polyserias Hincksii*, in honour of the Rev. T. Hincks, whose writings on the Hydroida are deservedly held in high estimation; another species of the same genus, of which the hydrothecæ are joined to the stem as in *Thuiaria*, I name *Polyserias glacialis*. I found several other species of this genus in the collection of Hydroids in the St.-Petersburg Museum of the Academy of Sciences, brought from the Sea of Ochotsk and Kamtschatka. Another interesting genus, also from the White Sea, was found by Professor Wagner of the St.-Petersburg University, to which I have given the name *Oorhiza*. It is distinguished by having sporosacs with only one egg rising from the hydrorhiza without the aid of a blastostyle, by which it differs from *Hydractinia*, which always has blastostyles. In all else there is very little difference from *Hydractinia* or *Podocoryne*; therefore it belongs to the family Hydractiniidæ. A species of *Sertularia* is interesting, from having its hydrorhiza continuous, formed by the confluence of the separate threads. I shall name this species, which is also from the White Sea, *Sertularia albimaris*.

EXPLANATION OF THE PLATES.

Plate V.

Fig. 1. *Tellina solidula* with a colony of *Monobrachium parasitum*, magnified: *a*, a young *Protohydra*-like specimen; *b*, gonophore.

Fig. 2. Three specimens of fully matured hydranths and a gonophore, more magnified: *a*, the oral orifice of the body; *b*, its single tentacle; *c*, chitinous membrane, covering the cœnosarc and forming a continuous hydrorhiza; *d*, a slightly developed hydrocaulus; *e*, gonophore.

Fig. 3. A gonophore pressed by a covering-plate: *a*, chitinous membrane covering the medusa; *b*, umbrella of the medusa; *c*, the short pedicle of the gonophore; d^1 d^2, a pair of sexual sacs; d^5 d^6 d^7 d^8, the same; d^3, sac only, the other is omitted; g^1, g^2, g^3, g^4, the four radiating canals; f^1, ,f^2, f^3, f^4, the four principal tentacles, into which are continued the radiating canals, and between which are disposed the other twelve tentacles.

Fig. 4. A gonophore less compressed by a covering-glass: a^1a^2, two radiating canals, very distinctly seen; b^1, b^2, b^3, b^4, four tentacles, the first developed; *c*, chitinous membrane.

Fig. 5. A gonophore with the eight sexual sacs seen through the coverings.

Fig. 6. The same gonophore seen from above; the sixteen tentacles are seen.

(All the figures excepting figs. 1 and 2 are drawn by the camera lucida.)

Plate VI. (drawn by the camera lucida).

Figs. 7, 8, 9, 10. Transverse sections of the hydranth.

Fig. 11. A thread-cell.

Fig. 12. Transverse section of a gonophore in an advanced state of development, with the umbrella, the four radiating canals, and the eight sexual sacs.

Fig. 13. Transverse sections of the same gonophore, but at a higher part of it, where the original four sacs are not yet quite divided longitudinally into eight. *a* and *b* are the two opposite sacs at a more advanced stage of longitudinal division than the two other sacs.

Fig. 14. The same from another gonophore, not yet so mature as in figs. 6, 7, but made at the same part of it as the section presented in fig. 6.

Fig. 15. *Polyserias Hincksii*, nat. size.

Fig. 16. The same, magnified.

XXXI.—*The Post-tertiary Fossils procured in the late Arctic Expedition; with Notes on some of the Recent or Living Mollusca from the same Expedition.* By J. Gwyn Jeffreys, LL.D., F.R.S.*

Mr. Edgar Smith, of the British Museum, has published, in the 'Annals and Magazine of Natural History' for this month

* Communicated by the author, and read at the Plymouth Meeting of the British Association, 20th Aug. 1877.